

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

## FINAL EXAMINATION

TRIMESTER 2, 2019 / 2020

### PEM0046 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Engineering)

14 MARCH 2020  
9:00 a.m. – 11:00 a.m.  
(2 Hours)

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#### INSTRUCTIONS TO STUDENT

1. This Question paper consists of **SIX** printed pages including the cover page.
2. Attempt **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary working steps **MUST** be shown.
4. Statistical table is provided.

Answer ALL questions [100 marks].

QUESTION 1 [25 marks]

- a. **Diagram 1-1** shows a spinner that is divided into five sections numbered 0, 1, 2, 3 and 4 with respective angles on each section. **Diagram 1-2** shows an envelope that consists of six cards numbered 1, 2, 3, 4, 5 and 6. Both of the items are used in a game.

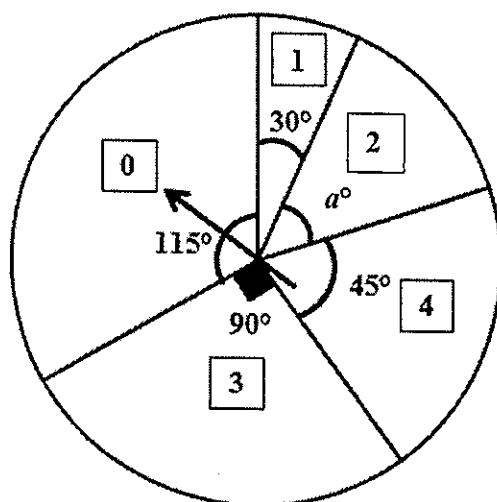


Diagram 1-1

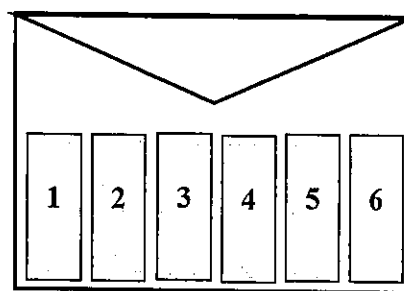


Diagram 1-2

To play this game, a player needs to spin the spinner and selects randomly a card from the envelope. The total points are the addition of the point on the spinner and the number on the card.

If a player gets 0 point from the spinner, he/she will be disqualified (cannot proceed with the game). The player who gets at least 8 points will be rewarded with a gift.

- Find the value of  $a^\circ$ . [1 mark]
- If  $X$  denotes the random variable of total points obtained in the game, what are the possible values of  $X$ ? [1 mark]

If Sarah participates in this game,

- find the probability that Sarah gets only 1 point in the game. [1 mark]
- find the probability that Sarah will get a gift at the end of the game. [4 marks]

Continued...

- b. The mileage (in thousands of miles) that car owners get with a certain kind of tyre is a random variable having the probability density function of  $f(y)$  :

$$f(y) = \begin{cases} cy^2 & ; 0 \leq y < 2 \\ y-2 & ; 2 \leq y < 3 \\ 0 & ; \text{otherwise} \end{cases}$$

- i. Prove that the value of constant  $c$  is  $\frac{3}{16}$ . [4 marks]
- ii. Find  $P(1.5 \leq Y \leq 2.5)$ . [4 marks]
- iii. Calculate the mean of  $Y$ . [4 marks]
- iv. Calculate the standard deviation of  $Y$ . [6 marks]

Continued...

**QUESTION 2 [25 marks]**

- a. The probability of a consumer from a particular area shopping online is  $p$ . A sample of 5 consumers are chosen at random from this area,
- find the value of  $p$  if the probability that none of the consumer shopping online is  $\frac{1}{243}$ . [4 marks]
  - find the probability that at least one of the consumer shopping online. [2 marks]
  - find the probability that from 2 to 4 of the consumers shopping online. [3 marks]
  - find the mean and standard deviation for the consumers that **DO NOT** shopping online. [2 marks]
- b. The number of breakdown of a computer follows a Poisson distribution with a mean of 0.3 per week. Find the probability that the computer will operate
- without breakdown for two consecutive weeks. [1 mark]
  - with at least 1 breakdown in one week and at most 3 breakdowns in the next week. [2 marks]
- c. The masses of all students in Probability class have a normal distribution with a mean of 54 kg and a variance of 144 kg<sup>2</sup>.
- Find the probability that a randomly selected student will have a mass more than 60 kg. [2 marks]
  - Find the probability that a randomly selected student will have a mass more than the population mean by at least 1 kg. [3 marks]
  - Find the probability that a randomly selected student will have a mass within 2 kg of the population mean. [3 marks]
  - Given that 70% of the students in Probability class have mass more than  $m$  kg. Find the value of  $m$ . [3 marks]

**Continued...**

**QUESTION 3 [25 marks]**

- a. The data below is the marks of midterm test for all five students in a small statistics class.

75                  83                  61                  50                  70

Consider all possible samples of **size three** which can be drawn without replacement from this population.

- i. Find the mean,  $\mu$  and standard deviation,  $\sigma$  of the population. [3 marks]
  - ii. If a random sample of 3 students which includes the scores 75, 61, and 70 is chosen from this population, calculate the non-sampling error if we record 61 as 62 by mistake. [2 marks]
  - iii. List all the possible samples of size three (without replacement) from this population; hence determine the sample mean and the sampling error for each sample. (Leave your answer in 2 decimal places). [5 marks]
  - iv. Construct a sampling distribution of the sample mean in a table. [3 marks]
- b. A machine in a manufacturing plant is calibrated to produce a bolt that has a mean diameter of 11 cm and a standard deviation of 1.2 cm. Assume that the diameter of all bolts manufactured are normally distributed. If an engineer takes a random sample of 64 bolts from this machine, find
- i. the value of  $\mu_{\bar{x}}$  and  $\sigma_{\bar{x}}$ . [2 marks]
  - ii. the probability that the diameter of sample mean will be less than 11.25 cm. [2 marks]
  - iii. the probability that the diameter of sample mean will be between 10.8 cm and 11.15 cm. [4 marks]
  - iv. the probability that the diameter of sample mean will be less than the population mean by 0.10 cm or more. [4 marks]

**Continued...**

**QUESTION 4 [25 marks]**

A lecturer from Future College is interested in finding out if the Number of Absences,  $x$ , in a Probability course is related to the Final Exam Result,  $y$ , for the students in her class. She took a sample of 10 students and determines the Final Exam Result for each of them and records the data in the table below.

Number of Absences, $x$ (days)	1	0	2	6	4	3	3	5	1	0
Final Exam Result, $y$ (marks)	95	90	90	55	70	80	85	50	93	92

- Draw a scatter diagram of  $y$  against  $x$ , on the graph paper provided. [2 marks]
- Find the equation of the regression line. Hence, graph the line on the scatter diagram. [16 marks]
- Predict the Final Exam Result for a student who has been absent for 8 days. [2 marks]
- Find the correlation coefficient between  $x$  and  $y$  and conclude your finding. [5 marks]

(Note: For Question 4, leave all your answers in 3 decimal points)

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